REMARKS

Claims 1-18, 21, 24 and 26-28 are pending in the application and are presented for examination upon entry of the present amendment. Claims 1 and 26 are independent. Claims 1, 3, 13 and 26 have been amended, claims 27-28 have been added and claims 19, 20, 22, 23 and 25 have been canceled without prejudice and disclaimer of subject matter. No new matter has been added. Support for the amendments and new claims can be found throughout the original application, and in particular, with respect to claim 27, in Figs. 6 and 11, and with respect to claim 28, as found in par. [0081] of the application.

Each of the issues raised in the March 2, 2009 outstanding Office Action are addressed below.

Claim rejections, 35 U.S.C. § 112

Claim 13 was rejected as being indefinite under § 112, 2nd paragraph, in view of alleged insufficient antecedent basis for the limitation "the primary centerline". Accordingly, Applicants have amended claim 13 to refer to "a primary centerline", which overcomes this rejection. Applicants now respectfully submit that this rejection is now moot and request that the subject § 112 rejection be withdrawn.

Claim rejections, 35 U.S.C. § 101

Claim 1 was rejected under § 101, 1st paragraph, as allegedly not falling within the four statutory categories of invention. While not directly addressing the Examiner's allegation with regard to this rejection (to which Applicants reserve the right to do so), Applicants have amended claim 1 to recite an imaging system to tie the claimed method to an apparatus, in an effort to move

prosecution of the present application forward. Accordingly, Applicants now consider this rejection also moot and respectfully request that the rejection be withdrawn.

Claim rejections, 35 U.S.C. § 102

Claim 26 was rejection under § 102 as being unpatentable over USPN 2004/026175 to Florent et al. ("Florent"). Specifically, the Examiner indicated that it was unclear with respect to the processor, whether the processor is configured with the claimed instructions, or if the processor merely needs to be capable of operating a program with such instructions. The Examiner interpreted the language to merely be capable of operating a program with such instructions.

While not addressing the merits of the Examiner's interpretation, and also in an effort to move the prosecution of the present application forward, Applicants have amended claim 26 to clarify that the processor is configured with the application program having instructions for the claimed process. Accordingly, Applicants believe that current amended claim 26 overcomes the §102 rejection, at least because Florent does not teach a processor configured with an application having instructions for: tracing the edges of the vessel in the first or in the second image, determining radius and densitometry values along the vessel in the first or in the second image, or determining a three dimensional reconstruction of the vessel.

Instead, Florent is understood to teach the identification of a tool such as a stent, based upon a marker attached to said tool. Florent does not generate a three dimensional model of the vessel but is operative only in identifying the location of the tool within the vessel.

Thus, Florent does not disclose all elements of present claim 26 and therefore cannot anticipate claim 26. For at least this reason, reconsideration and withdrawal of the 102 rejection of claim 26 is now respectfully requested.

Claim rejections, 35 U.S.C. § 103

Claims 1-4, 7-10, 12, 15, 17, 18, 24 and 26 were rejected under § 103 as being unpatentable over U.S. Pat. 6,301,498 to Greenberg et al. ("Greenberg "), in view of U.S. Pat. App. Pub. No. 2004/0171932 to Raman et al. ("Raman"). For the following reasons, Applicants respectfully submit that amended claims 1 and 26 are patentable over the cited prior art.

Present claim 1 is directed to a method for three-dimensional reconstruction of a single tubular organ using a plurality of two-dimensional images comprising: displaying on a display a first image of a vascular network, captured by an imaging system; receiving input for identifying on the first image a vessel of interest; tracing the edges of the vessel of interest including eliminating false edges of objects visually adjacent to the vessel of interest; determining substantially precise radius and densitometry values along the vessel; displaying on a display a second image of the vascular network, captured by the imaging system; receiving input for identifying on the second image the vessel of interest; tracing the edges of the vessel of interest in the second image, including eliminating false edges of objects visually adjacent to the vessel of interest; determining a three dimensional reconstruction of the vessel of interest from the edges of the vessel of interest as traced from the first image and from the second image; and determining fused area measurements along the vessel from the substantially precise radius and densitometry values along the vessel of interest in the first image and in the second image. Claim 26 recites similar patentable features.

Greenberg

Applicants respectfully submit that Greenberg does not teach ***at least determining the 3D reconstruction and the fused area measurements*** as claimed. Present claim 1 claims determining a three dimensional reconstruction of a vessel from **two X-ray images** of a vascular network. Greenberg, however, is understood by Applicants to use **at least four images**. Specifically:

> "Our invention utilizes two or more X-ray images of carotid arteries. The X-ray images represent selective catheter angiograms recorded with a digital system. The angiographic equipment is said to be "**biplanar**" because the artery to be studied is placed substantially on one plane and the angiographic equipment rotates

> on a plane that is substantially perpendicular to the plane the arm is on. As can be seen in FIG. 3, the arm of the angiographic equipment rotates on a plane allowing images to be taken from different angles. **The biplanar equipment simultaneously takes at least two sets of images, each set of images consisting of two individual images that are 90° apart, so that the total number of images equals at least 4** [*emphasis, ours*]. Typically, two shots 45° apart are taken, resulting in four equidistant angiograms: -45°, 0°, 45°, and 90° (or equivalently, 0°, 45°, 90°, and 135°). Such equipment is conventional.

Greenberg, col. 6 ll. 14-30.

Thus, although Greenberg mentions working with two images, each "image" referred to is actually a biplanar image which is **a set consisting of two images perpendicular to each other**. Present claim 1, in contrast, requires a step of determining a three dimensional reconstruction of the vessel of interest from the edges of the vessel of interest as traced from the first image and from the second image, that is, two single images, not "biplanar" images which consist of two separate images each (i.e., four images).

Accordingly, in view of Greenberg requiring at last four images, Applicants respectfully submit that Greenberg fails to disclose, teach or suggest generating a three-dimensional model from only two images as claimed. Moreover, present claim 1 requires a step of determining fused area measurements along the vessel from the substantially precise radius and densitometry values along the vessel of interest in the first image and in the second image. Greenberg does not disclose, teach or suggest such a feature as well (i.e., determining fused area measurements from data determined from only two images).

For at least the above noted reasons, claims 1 and 26 are patentable over the cited prior art, as are their respective dependent claims.

Greenberg and Raman can not be combined to teach claim 1

Even assuming, *arguendo*, that Greenberg indeed teaches the above mentioned elements of claim 1, the combination of Greenberg and Raman is unobvious and counter-intuitive. Specifically, Greenberg is understood by Applicants to be directed at generating a three dimensional shape of an artery. Raman, however, takes a volumetric (i.e., three-dimensional) dataset as a starting point, i.e., as input. For example, as set out in paragraph [0017] of Raman:

> "In one embodiment of the present method a volumetric computed tomography angiography (CTA) dataset is used".

It is thus counter-intuitive to try and cure deficiencies in the method of Greenberg, by a reference which teaches receiving as input the product of said method. Further, Raman is directed to a method for determining aortoiliac endoluminal irregularities in vessels *two-dimensionally,* and not to three-dimensional vessel reconstruction.

For at least those reasons, Greenberg and Raman, either alone or in combination do not disclose, teach or suggest all the elements of claims 1 and 26, and any attempt to combine their teachings is counter-intuitive. Accordingly, claims 1 and 26 are patentable for at least the above-foregoing reasons and reconsideration and withdrawal of the subject § 103 rejection of these claims is respectfully requested.

Claims 2-4, 7-10, 12, 15, 17, 18, 24 and 27-28 depend from one or another of claims 1 and 26, and thus, incorporate by reference all the features recited in their base independent claims. Thus, for at least the reasons given for claims 1 and 26, their dependent claims are patentable for the same reasons. Accordingly, Applicants respectfully request that the § 103 rejection be withdrawn.

Applicants note that the dependent claims contain additional features absent from the prior art of record, and thus, separate consideration of patentability of these claims is requested should the Examiner after review of Applicants patentability position allege that base independent claims 1 and 26 are not patentable.

For example:

- **Claim 3** requires determining a **centerline** of the vessel of interest, comprising a plurality of centerline points. On page 6 of the office action, the Examiner stated that on col. 10 ll. 46-63, Greenberg teaches tracing the edges of a vessel of interest. While Applicants disagree with the Examiner's statement and its context, Applicants submit that at most, Greenberg only appears to teach determining the circumference of the artery since Greenberg analyzes cross sectional images. Thus, there is no way to combine displaying and analyzing cross sections of a tubular organ with determining a centerline of the organ, since such a centerline is only shown when the image plane is not perpendicular to the artery. Such a centerline can not be determined or visualized in cross sectional images.

- **Claims 7-9** require that the input for identifying the vessel of interest comprises points related to the areas having **stenosis**, including a point that is distal to the stenosis and a point that is proximal to the stenosis. While Raman may teach marking three points, nowhere does Raman disclose, teach or suggest that the points are related to stenosis.

- **Claims 17 and 18** relate to determining **healthy** vessel dimensions. On col. 10 ll. 45-63, Greenberg is understood to teach an iterative process, but does not refer to any healthy portions of the vessel of interest.

CONCLUSION

In view of the foregoing remarks, Applicants submit that all the issues raised in the outstanding Office Action have been addressed and the application is in condition for allowance. Accordingly, Applicants respectfully request favorable reconsideration and early passage to issue of the present application. If there are any questions regarding this Response, the Examiner is

encouraged to contact the undersigned at the telephone number provided below to discuss any issues and work them out so as to advance the application to allowance as soon as possible.

No fees, save for the fee for extending the time of response, are due for the filing of the present response. If any additional fees are required or if any refunds are due, the USPTO is authorized to charge or credit Deposit Account Number: 50-0311, Customer Number: 35437, Reference Number: 28460-502NAT.

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